

CLAIMS

1. A method of creating an enterprise control architecture, the method comprising:

establishing five echelons of control, a first echelon, a second echelon, a third echelon, a fourth echelon, and a fifth echelon, each echelon having one or more objects, the first echelon having an object that encapsulates a production process, the second echelon having an object that provides control over the production process, the third echelon having an object that coordinates processes executed at the first echelon in light of enterprise objectives, the fourth echelon having an object that provides planning and development functions, the fifth echelon having an object that provides supervisory control and that determines the enterprise objectives; and

connecting each of the five echelons with a plurality of control links.

2. A method as claimed in claim 1, further comprising:

configuring each object of the first echelon such that each object may include an information port.

15 3. A method as claimed in claim 1, further comprising:

configuring the third echelon to include an object that audits performance of processes at the first echelon.

4. A method as claimed in claim 1, further comprising:

dividing an enterprise into multiple levels and, for each level, establishing five echelons of control.

20 5. A method as claimed in claim 1, further comprising:

dividing a system into multiples levels, and for each level, establishing five echelons of control.

6. A method of creating an enterprise control architecture, the method comprising:

dividing a system into multiple levels,

for each level, establishing five echelons of control, a first echelon, a second echelon, a third echelon, a fourth echelon, and a fifth echelon, each echelon having one or more objects, the first echelon having an object that encapsulates a production process, the second echelon having an object that provides control over the production process, the third echelon having an object that coordinates processes executed at the first echelon in light of enterprise objectives, the fourth echelon having an object that provides planning and development functions, the fifth echelon having an object that provides supervisory control and that determines the enterprise objectives;

configuring each object of the first echelon such that each object may include an information port;

configuring the third echelon to include an object that audits performance of processes at the first echelon; and

connecting each of the five echelons with a plurality of control links.

7. A method as claimed in claim 6, wherein the first echelon has an object that encapsulates a supply chain process and a second object that encapsulates an asset chain process.

20 8. A method as claimed in claim 7, wherein the first object operates according to a first transform function.

9. A method as claimed in claim 8, wherein the transform function is $y_a^{k,l}(t+dt) = k_a^{k,l} \prod^{k,l} [x_a^{k,l}(t)].$

25 10. A method as claimed in claim 7, wherein the second object operates according to a second transform function.

11. A method as claimed in claim 10, wherein the transform function is $y_s^{k,l}(t+dt)$
 $= k_s^{k,l} \Phi^{k,l} [x_s^{k,l}(t)].$

12. An enterprise control system comprising:

5 a plurality of value production units connected in an addressable grid, each
production unit having

a first echelon, a second echelon, a third echelon, a fourth echelon, and
a fifth echelon, each echelon having one or more objects, the first echelon
having an object that encapsulates a production process and that includes an
information port, the second echelon having an object that provides control
10 over the production process, the third echelon having an object that
coordinates processes executed at the first echelon in light of enterprise
objectives and an object that audits performance of processes at the first
echelon, the fourth echelon having an object that provides planning and
development functions, the fifth echelon having an object that provides
15 supervisory control and that determines the enterprise objectives; and

a plurality of control links connecting each of the five echelons.

13. A system as claimed in claim 12, wherein the first echelon has an object that
encapsulates a supply chain process and a second object that encapsulates an asset
chain process.

20 14. A system as claimed in claim 13, wherein the first object operates according to
a first transform function.

15. A system as claimed in claim 14, wherein the transform function is $y_a^{k,l}(t+dt)$
 $= k_a^{k,l} \Pi^{k,l} [x_a^{k,l}(t)].$

25 16. A system as claimed in claim 13, wherein the second object operates
according to a second transform function.

17. A system as claimed in claim 16, wherein the transform function is $y_s^{k,l}(t+dt)$
 $= k_s^{k,l} \Phi^{k,l} [x_s^{k,l}(t)].$

18. A system as claimed in claim 14, further comprising:

a router configured to control communications between at least some of the plurality of value production units.

19. A method of network-based, real-time command and control of an enterprise,

5 the method comprising:

providing a communications network;

providing an interface for connecting to the network;

providing an application interface for connecting to an enterprise application;

providing one or more value production units, each value production unit

10 having four full-duplex ports;

providing a router to dynamically create connections between the one or more value production units;

providing one or more enterprise process controls, at least some of the one or more enterprise process controls coupled to at least some of the one or more value

15 production units; and

providing at least one enterprise management interface.

20. A system of network-based, real-time command and control of an enterprise, the system comprising:

an enterprise operating system having an interface layer, a performance measurement layer, a process control layer, and a performance management layer;

5 one or more value production units, each value production unit having four full-duplex ports and interfaced with the performance measurement layer of the enterprise operating system; and

a router to dynamically create connections between the one or more value production units.

10 21. A system for controlling an enterprise, the system comprising:

a plurality of enterprise units, each enterprise unit having a first echelon including at least two objects, each object configured to execute a production process, a second echelon including at least one object to control one of the production processes of the first echelon, a third echelon including an object to coordinate processes based on objectives and available shared assets, a fourth echelon including an object to provide planning and development, and a fifth echelon having an object to set the objectives of the enterprise unit;

a potentiality measurement tool coupled to the fourth echelon;

a capability measurement tool coupled to the third echelon;

20 an actuality measurement tool coupled to the first echelon; and

a performance metrics engine coupled to the performance measurement tool, the capability measurement tools, and the actuality measurement tool.

22. An enterprise operating system comprising:
 - a network interface layer configured to support one or more virtual machine services and one or more application interfaces;
 - a performance measurement layer configured to support one or more value production processes;
 - a process control layer configured to support one or more supervisory processes; and
 - a management interface layer configured to support one or more enterprise management interfaces.

23. An enterprise control architecture comprising:

- a bridge configured to generate graphical information readable by a human and to generate command messages based on inputs from a human;
- a modeler coupled to the bridge;
- 5 a plurality of multi-level production units coupled to a router;
- a command parser coupled to the bridge and the router and operable to extract individual messages intended for specific ones of the plurality of multi-level production units from the command messages;
- 10 an operations interface operable to receive raw data from selected levels of the plurality of multi-level production units;
- an operations data acquisition service coupled to the operations interface, the operations data acquisition service operable to deliver raw data to a data store;
- 15 a data filter coupled to the operations data acquisition service, the data filter operable to process the raw data to generate processed data and to deliver the processed data to a data base;
- a performance measurement engine coupled to the data filter and the modeler, the performance measurement engine operable to generate performance metrics;
- 20 an alarms and events engine coupled to the performance measurement engine and operable to generate alarm messages and event messages based on performance metrics received from the performance measurement engine;
- a history engine coupled to the performance measurement engine and the alarms and events engine, the history engine operable to log alarms and events in a data store, the alarms and events based on the alarm messages, event messages, performance metrics, or a combination of the same;

a report generator coupled to the history engine and operable to generate reports based on the alarms and events generated by the history engine;

a display generator coupled to the history engine, the report generator, and the alarms and events engine;

5 an icon engine coupled to the modeler and the display generator; and

 a display coupled to the display generator.

24. A graphical interface for an enterprise control system, the graphical interface comprising:

 a center dash board;

10 a first set of links to a plurality of control panels, each control panel configured to display a representation of a single level of a multi-level business unit; and

 a second set of links to a plurality of portals, the plurality of portals including an investor portal, customer portal, a supplier portal, and a subordinate portal.

15